First Five-Year Review Report

for

Smeltertown Superfund Site
Operable Units 1 and 2

Chaffee County
Salida, Colorado

September 2005

PREPARED BY:

U.S. Environmental Protection Agency, Region 8
Denver, Colorado

Approved by:

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U.S. Environmental Protection Agency, Region 8

Date: 9/28/05

Five-Year Review Report

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Attachments

List of Acronyms

AOC	Administrative Order on Consent
ARARs	Applicable or Relevant and Appropriate Requirements
AS	Colorado Water Quality Commission Agricultural Standard
BRA	Baseline Risk Assessment
BWQS	Colorado Water Quality Commission Basic Water Quality Standards
CD	Consent Decree
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CTE	Central Tendency Estimate
HQ	Hazard Quotient
IC	Institutional Control
DNAPL	Dense Non-Aqueous Phase Liquid
MCL	Maximum Contaminant Levels
MDL	Method Detection Limit
NCP	National Contingency Plan
NPL	National Priority List
O&M	Operation and Maintenance
OU1	Operable Unit 1
OU2	Operable Unit 2
PAH	Polycyclic Aromatic Hydrocarbons
PRP	Potentially Responsible Party
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
ROD	Record of Decision
SDWA	Safe Drinking Water Act
ug/L	Microgram per Liter
USEPA	United States Environmental Protection Agency

Executive Summary

The U.S. Environmental Protection Agency (EPA) Region 8 conducted the first five-year review of the remedial actions implemented at the Smeltertown Superfund Site (the Site) near Salida, Colorado. The purpose of the five-year review is to determine whether the Site remedy is protective of human health and the environment. The trigger action for this review is the initiation of remedial action under the OU2 ROD. Because hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unrestricted use and unlimited exposure, a five-year review is required by statute.

The Site is located in Chaffee County, about one mile northwest of Salida, Colorado. It is comprised of 120 acres near the Arkansas River and is surrounded by a few residences and several industries. The Site is divided into three Operable Units. Operable Unit No. 1 (OU1) is the location of an historic lead/zinc smelting operation area and includes an area of waste consolidation. Operable Unit No. 2 is the location of a former wood treating facility and the current location of a sand and gravel mine. Operable Unit No. 3 is the current location of the CoZinCo facility that manufactures zinc sulfate. This five-year review addresses only OU1 and OU2.

Wastes associated with the smelter included soils contaminated with a wide array of metals. Many of the original contamination sources were removed from the Site prior to EPA's involvement. However, deposits of smelter wastes and soils with elevated levels of arsenic (>387 milligrams per kilogram (mg/Kg)) and lead (>2,235 mg/Kg) were identified in seven distinct areas within 1,300 feet of the former smelter smokestack. The depth of contamination above the remedial goals ranged between 0.5 and 2.0-feet. The OU1 remedy required smelter wastes and contaminated soils to be consolidated along with wastes from OU2 under a soil cover. Groundwater monitoring wells were installed around the downgradient side of the consolidation area to monitor the water quality.

Wood treating wastes (including dense non-aqueous phase liquid (DNAPL)) from historic sources primarily on OU2 migrated through the shallow aquifer leaving a residual coating of DNAPL on the surface of the aquifer materials. The remaining DNAPL migrated to the east along the base of the aquifer. Dissolved wood treating constituents continued to migrate in the direction of groundwater flow to the south towards the Arkansas River. DNAPL has been reported discharging from one spring along the bluff of the river. The contaminants of concern for the portion of the Site impacted by wood treating operations include dioxin isomers, pentachlorophenol and polycyclic aromatic hydrocarbons which are constituents of creosote.

The remedy for OU2 requires that the land use be restricted to non-residential, prohibits water wells in the shallow aquifer (excluding monitoring wells), prohibits mining within the source areas, requires fence construction around one hillside spring and requires monitoring of wood-treating constituents in groundwater to verify that they do not migrate beyond their location at the time of remedy implementation. Mining prohibition in the source area included delineation of a Mining Restricted Area through the establishment of surveyed monuments.

Remedial construction was completed in OU1 and OU2 in September 2003 and May 2002, respectively.

No major concerns were identified during this review. However, several inconsistencies were noted between the decision and planning documents in connection with groundwater monitoring and between the planning documents and the actual monitoring program as implemented. Other inconsistencies were noted in the performance standards between the OUs.

The remedy as implemented is currently protective of human health and the environment. Contaminated ground water associated with OU1 and OU2 is not currently used. Soils and smelter wastes containing contaminants above performance standards are isolated from humans through engineering and administrative controls.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name: Smeltertown Superfund Site, Operable Units 1 and 2.		
EPA ID: COD983769738		
Region: 8	**State:** CO	**City/County:** Salida/Chaffee

SITE STATUS	
NPL status: Proposed 2/7/92	
Remediation status: Operating	
Multiple OUs: Yes	**Construction completion date:** OU1 – Final Closeout Report issued – 4/6/04 OU2 – Remedial Action Report issued – 5/02
Has site been put into reuse? No – OU1, Yes – OU2	

REVIEW STATUS	
Lead agency: EPA	
Author name: Rebecca Thomas	
Author title: Project Manager	**Author affiliation:** U.S.EPA, Region 8
Review period: 9/21/00 to 9/21/05	
Date(s) of site inspection: 07/12/05	
Type of review: Statutory	
Review number: 1 (first)	
Triggering action: Actual remedial action (RA) onsite construction	
Triggering action date: Remedial Construction Initiated in OU2 – 9/00	
Due date: 9/05	

* ["OU" refers to operable unit.]

Five-Year Review Summary Form, cont'd.

Issues:

Item No.	Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1	Institutional Controls on land use in OU1 appear to be in draft form.	N	Y
2	Perimeter fence surrounding OU1 consolidation requires minor repair.	N	Y
3	Cadmium regularly detected above groundwater performance standard at OU1.	N	N
4	Detection limit for dibenzo(a,h) anthracene is higher than groundwater monitoring performance standard for OU1.	N	N
5	MCL for arsenic in OU1 to be revised downwards from 50 ug/L to 10 ug/L effective January 23, 2006.	N	TBD[1]
6	An apparent "extra" monument was noted in the northeast portion of the MRE in OU2.	N	N
7	Detection limits and analytical suite for groundwater monitoring at OU2 are inconsistent with requirements of the ROD and Remedial Work Plans.	N	TBD
8	Application of ARARs in lieu of risk-based remedial goals for groundwater are inconsistent between OU1 and OU2.	N	TBD
9	Many intake assumptions and toxicity values have been revised by USEPA since completion of the BRA.	TBD	TBD
10	The use of 1E-6 residential scenario for establishing groundwater performance standards is inconsistent with the use of 1E-4 as the acceptable risk level for industrial soils.	TBD	TBD

1 - To Be Determined

Five-Year Review Summary Form, cont'd.

Recommendations and Follow-up Actions:

Item No	Issues	Recommendations and Follow-up Actions	Party Responsible	Due Date
1	Institutional Controls on land use in OU1 appear to be in draft form.	Evaluate effectiveness.	EPA	December 2006
2	Perimeter fence surrounding OU1 consolidation requires minor repair	Repair perimeter fence.	PRP	December 2005
3	Cadmium regularly detected above groundwater performance standard at OU1	Continue monitoring of ground water quality trends.	PRP/EPA	On Going
4	Detection limit for dibenzo(a,h) anthracene is higher than groundwater monitoring performance standard for OU1.	Modify analytical method to achieve required detection limits.	PRP	October 2005
5	MCL for arsenic in OU1 to be revised downwards from 50 ug/L to 10 ug/L effective January 23, 2006.	Revise groundwater performance standards.	EPA/CDPHE	December 2006
6	An apparent "extra" monument was noted in the northeast portion of the MRE.	Eliminate the extra monument.	PRP	October 2005
7	Detection limits and analytical suite for groundwater monitoring at OU2 are inconsistent with requirements of the ROD and Remedial Work Plans.	Modify analytical method to achieve required detection limits and add missing chemicals to analytical suite.	PRP	December 2006
8	Application of ARARs in lieu of risk-based remedial goals for groundwater are inconsistent between OU1 and OU2	Remedial goals will be evaluated for groundwater for OU1 and OU2.	EPA/CDPHE	December 2006
9	Many intake assumptions and toxicity values have been revised by USEPA since completion of the BRA	Assess existing soil chemical data to determine whether remaining contamination poses a health risk above a level of concern.	EPA/CDPHE	December 2006
10	The use of 1E-6 residential scenario for establishing groundwater performance standards is inconsistent with the use of 1E-4 as the acceptable risk level for industrial soils.	Evaluate remedial goals for OU1 and OU2.	EPA/CDPHE	December 2006

Five-Year Review Summary Form, cont'd.

Protectiveness Statement(s):

The remedy as implemented is currently protective of human health and the environment. Contaminated ground water associated with OU1 and OU2 is not currently used. Soils and smelter wastes containing contaminants above performance standards are isolated from humans through engineering and administrative controls.

Other Comments:

Reconcilliation of inconsistencies noted in groundwater performance standards between OU1 and OU2 will be evaluated.

Some risk-based remediation goals for groundwater are in the low nanogram per liter range. Such low levels suggest that in source areas, groundwater performance levels may not be achieved for many decades. Risk based remediation goals for groundwater are based on 1E-6 cancer risk under a residential scenario. However, risk-based remediation goals for contaminated soils in source areas (MRA) overlying groundwater are based on a 1E-4 cancer risk under an industrial use scenario. It may be appropriate to adjust risk based remediation goals for groundwater to be consistent with the acceptable risk level for overlying soils (1E-4).

Five-Year Review Report

I. Introduction

Purpose of the Review

The purpose of five-year reviews is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, five-year review reports identify issues found during the review, if any, and recommendations to address them.

Authority for Conducting the Five-Year Review

The U.S. Environmental Protection Agency (EPA) is preparing this five-year review pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The EPA interpreted this requirement further in the National Contingency Plan (NCP); 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

Who Conducted the Five-Year Review

The EPA Region 8 conducted the five-year review of remedial actions implemented at Smeltertown Operable Unit 1 and 2 Site (the Site) near Salida, Colorado. This review was conducted from July 2005 through September 2005. This report documents the results of the review. HDR Engineering, Inc. (HDR) of Denver, Colorado was retained by EPA Region 8 to provide technical support during preparation of the Five-Year Review Report. HDR was retained under a General Services Administration contract.

Other Review Characteristics

This is the first five-year review for the Site. The triggering action for this review is the initiation of remedial construction activities under the OU2 Record of Decision. Remedial construction at OU2 commenced in September 2000. Because hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unrestricted use and unlimited exposure, a Statutory Five-Year Review is required.

II. Site Chronology

Table 1

Chronology of Site Events

Event	Date
Lead/Zinc smelter operations (OU1/OU2)	1902-1920
Smelter dismantled (OU1/OU2)	1920
Railroad tie treating on former smelter site (OU2)	1926-1953
OU2 property sold by Koppers to Lowdermilk Company	1962
OU2 property sold to Butala Construction Co. (Butala)	1965
Smokestack (OU1) placed on Nation Register of Historic Places	1976
The area of former smelter operations (OU1) was purchased by E&R Trucking	1985
Creosote contaminated soil discovered on OU2	1986
Smeltertown proposed for National Priority List (NPL)	February 1992
Removal Action No. 3 to remove creosote waste and metal containing wastes/contaminated soils from residential areas and land proximal to the former smelter (OU1 and OU2)	Initiated on September 27, 1993
Butala enters into a CD with EPA to provide personnel and equipment for excavation of creosote contamination described under Removal Action No. 3	January 10, 1995
Beazer East, Inc. (Beazer) enters into an Administrative Order on Consent (AOC) to conduct a remedial investigation and feasibility study (RI/FS) of OU2. Koppers Company, Inc had changed its name to Beazer Materials and Services, Inc., and was subsequently changed again in 1990 to Beazer East, Inc.	October 1995
Beazer completes RI/FS of OU2 under 1995 AOC	Early 1998
ROD is issued for OU2	June 1998
Beazer and Butala enter into a Consent Decree to conduct remedial design and remedial action (RD/RA) for OU2.	June 1, 2000
Remedial construction for the OU2 remedy begins with fence construction	September 21, 2000

Table 1

Chronology of Site Events

Event	Date
Phelps Dodge, Cyprus Amax Minerals and E&R Trucking enter into a Consent Decree to perform RD/RA for OU1	April 27, 2001
OU2 remedial construction completed (Remedial Action Report issued)	May, 2002
Remedial Design for OU1 completed	April 11, 2003
OU1 remedial construction completed	September, 2003

III. Background

Location and Setting:

The Site is located in Chaffee County, about one mile northwest of Salida, Colorado. The Site is comprised of 120 acres bounded on the north by County Road 150, the east by State Highway 291, and the south and west by the Arkansas River. The Site is the location of a former smelter and wood treating facility and is divided into three operable units (OUs) including:

- OU1 – historic lead/zinc smelting operation area
- OU2 – former wood treating facility
- OU3 – property owned by CoZinCo

This Five-Year review addresses OU1 and OU2.

The Site is currently surrounded by a few residences and several industries (See Site Map – Attachment 1). Tri-State Generation and Transmission Association, Inc. operates a substation approximately midway along the northern Site boundary. Butala Construction Company (Butala) is actively quarrying sand and gravel from the valley fill in the west and northwest portion of the Site. A peat packaging facility, which uses peat hauled in from elsewhere, is located southwest of the CoZinCo property. Salida Auto Salvage operates a facility open to the public south of CoZinCo.

The Site is generally zoned industrial. However, Chaffee County's industrial zoning allows residential development, as evidenced by the continued approval for construction of new homes in the area.

The Site is situated in the Arkansas River Valley approximately two miles up stream of Salida, Colorado. The Arkansas River flows southeast along the west side of the Site and then turns to the east along the south side of the Site. Land surface elevation at the Site ranges from 7,050 to 7,200 feet above sea level. The majority of the Site lies on a series of river terraces. Most of OU2 lies 40 to 50 feet above OU1 and OU3. The Arkansas River lies approximately 100 feet below OU1 and OU3. Between the terrace surface and the Arkansas River, there is a steep bluff that is vegetated with cottonwood trees and

underbrush. An old slag deposit is located 45 vertical feet down the bluff face. The upper surface of the slag deposit is relatively flat, and extends about 10 feet horizontally outward towards the river from the bluff face.

Four distinct hydrologic units have been identified at the Site within the valley-fill deposits: Upper and Lower Terrace Aquifers, Arkansas River Alluvial Aquifer and underlying all three of these aquifers are saturated glacial and basin-fill deposits. Groundwater in the Upper Terrace Aquifer occurs approximately 30-feet below the ground surface and flows towards the south. Groundwater in the remaining aquifers flows towards or parallel to the Arkansas River.

Some of the groundwater in the Upper Terrace Aquifer discharges to areas of diffuse seepage and springs with intermittent flow along the bluff of the Arkansas River approximately 40-feet below the river terrace.

Site History and Extent of Contamination:

Lead-Zinc Smelting

Industrial activity at the Site began in 1902 with the construction of a lead-zinc smelter by the Ohio and Colorado Smelting and Refining Company. The smelter operated from 1902 to 1919, and was sold at auction in 1920. During smelter operation, molten slag was disposed along the northern bank of the Arkansas River directly south of the smokestack. After auction the buyer stripped the facility of machinery, salvage, and brick and leased part of the 80-acre facility and the remaining buildings to Trinchera Timber Company in 1924. Trinchera Timber Company later became National Lumber and Creosoting. The area of former smelter operations was purchased by E&R Trucking in 1985. Two buildings and a 365-foot smokestack survive to this day and in 1976 the smokestack was placed on the National Register of Historic Places.

Wastes associated with the smelter included soils contaminated with a wide array of metals. Many of the original contamination sources were removed from the Site prior to EPA's involvement. However, remaining deposits of smelter wastes and soils with elevated levels of arsenic (>387 milligram per Kilogram (mg/Kg)) and lead (>2,235 mg/Kg) were identified in seven distinct areas within 1,300 feet of the former smelter smokestack. The depth of contamination above the remedial goals ranged between 0.5 and 2.0-feet. Each of the seven areas comprised between 189 and 2,771 cubic yards (cy). In addition, an existing stockpile comprised of 37,000 cy of contaminated soils was located immediately adjacent to and west of the smokestack.

Wood Treating

A portion of the former smelter site, including the smelter office building, was used by a series of railroad tie-treating companies (Koppers and its predecessors), beginning in 1926.

The treating operations included a pressure treating retort, drip racks, storage tanks, pole plant, and lagoons. In the retort building, railroad ties and other lumber products were pressure-treated with creosote in steel cylinders. The treated materials were then moved

from the retort building onto drip racks were they were temporarily stored until subsequent storage elsewhere on the former Koppers property. Historical drawings indicate four storage tanks were located west of the retort building and an additional three working tanks were located adjacent to the north side of the building. Historical aerial photographs also suggest the presence of two lagoons northeast of the retort building on the north side of the old Chaffee County Road 150. Wood treating operations ceased in 1953 when the wood treating plant was closed. The property changed hands several times and was redeveloped as a sand and gravel mine by Butala Construction Company (Butala) in 1965.

The former Koppers property has been cleared of most remains of past activity. The only structures remaining are the plant office building and a water storage tank, both on the upper terrace, and a gutted pump house near the Arkansas River. Butala used portions of the property for stockpiling of sand, gravel and other materials, and is mining outside the areas impacted by wood-treating operations.

From historic sources in the process area and lagoons, wood treating constituents moved downward through the vadose zone to the water table within the Upper Terrace Aquifer. Creosote, a dense non-aqueous phase liquid (DNAPL), continued to move downward to the bottom of the Upper Terrace Aquifer leaving a residual coating of DNAPL on the surface of the aquifer materials. The remaining DNAPL migrated to the east along the base of the aquifer. Dissolved wood treating constituents moved in the direction of groundwater flow to the south towards the Arkansas River bluff. Dense non-aqueous phase liquid has been reported discharging from one spring along the bluff of the river.

Visually impacted soils were observed in the former process area and the lagoons extending from just beneath the ground surface to the bottom of the Upper Terrace Aquifer. In addition, at least four trenches were identified where Butala reportedly disposed of creosote impacted soils uncovered during mining operations. However, these trenches did not extend to the water table. Surface and subsurface soil samples collected from soils without visual evidence of contamination generally contained less than 150 mg/Kg of polycyclic aromatic hydrocarbons (PAHs).

The contaminants of concern for the portion of the Site impacted by wood treating operations includes dioxin isomers, pentachlorophenol and PAHs which are constituents of creosote.

CoZinCo Facility

The southeast portion of the Site is occupied by Colorado Zinc Company (CoZinCo) industrial facility (OU3) which has been in operation since 1977. This facility manufactures zinc sulfate soil amendment. The facility and a number of source areas at the facility have been closed under Resource Conservation and Recovery Act (RCRA) orders issued by CDPHE. This five-year review does not include the CoZinCo facility (OU3).

Baseline Risk Assessment:

As part of a remedial investigation (RI), EPA prepared a Baseline Risk Assessment (BRA) for the overall Site in April 1995.

Smelter Facility (OU1)
The BRA's findings regarding human health risk at OU1 are summarized in the following table:

Table 2
OU1 Risk Estimates

Exposure Scenario	Probability of Blood Lead concentration >10ug/dl[1]	Cancer Risk	Hazard Quotient
Current downwind resident child (0-6 years)	3%	4E-5	5E-1
Future on Site resident child (0-6 years)	86%	6E-4	3E+1
Current trespasser	NA[2]	5E-6	2E-1

[1] - deciliter
[2] – not available

The concentration of contaminants in soils to be excavated and consolidated under the remedy for OU1 was based on an industrial land use scenario documented in an 1996 Action Memorandum and an April 27, 2001 Consent Decree as follows:

- Arsenic – 397 mg/kg
- Lead – 2,235 mg/kg

Wood Treating Facility (OU2)
For OU2 the BRA assessed carcinogenic risks and the potential for non-cancer health effects of 16 chemicals resulting from direct ingestion of contaminated surface and subsurface soils. Ingestion of surface soil and inhalation of subsurface soil particulates was considered for a current industrial worker (miner) and potential future residents. Ingestion of subsurface soil and inhalation of subsurface soil particulates was considered only for future construction workers.

The BRA reported a range of estimated cancer risk and non-cancer hazard index for each exposure scenario. These are summarized in Table 3 and 4.

Table 3
OU2 Cancer Risk Estimates

Exposure Scenario	RME[1]	CTE[2]
Current Industrial Miner	1E-4	9E-6
Future Construction Worker	5E-6	7E-7
Future Resident	5E-4	5E-5

[1] – Reasonable Maximum Exposure
[2] – Central Tendency Estimate

Table 4
OU2 Non-Cancer Hazard Index

Exposure Scenario	RME[1]	CTE[2]
Current Industrial Miner	3E-1	1E-1
Future Construction Worker	4E-2	7E-3
Future Resident	2E+1	1E+1

[1] – Reasonable Maximum Exposure
[2] – Central Tendency Estimate

Under the current and most likely future land use scenario (industrial) considered by the BRA, there would be no unacceptable risks from wood-treating constituents. However, the BRA did not consider risk, if any, to a hypothetical future miner ingesting subsurface soils. Therefore, remedial goals were established for subsurface soils at a concentration that presents a risk (for any individual chemical) of 1E-4 under EPAs default industrial scenario (Table 5).

Table 5
OU2 Remedial Goals for Soil

Chemical	**Concentration (mg/Kg)**
Benzo(a)anthracene	780
Benzo(a)pyrene	78
Benzo(b)flouranthene	780
Dibenz(a,h)anthracene	78
Indeno(1,2,3-ed)pyrene	780
Pentachlorophenol	4,768
HpCDD	0.2
HxCDD	0.02
HxCDF	0.02
OCDD	2.0

Cancer and non-cancer effects were not estimated for groundwater ingestion under any current or future land use scenario. Rather, remediation goals were calculated for groundwater based on a 1E-6 cancer risk under residential use scenario. These numerical performance standards are presented in Section VII (Technical Assessment).

Ecological Risks

The Ecological Risk Assessment (ERA) was conducted for the segment of the Arkansas River that spans the length of the Site as well as for the immediately surrounding riparian, wetland and terrestrial environments. An evaluation of OU1, OU2 and areas downwind of OU1 was also conducted as a future exposure area for terrestrial organisms.

The ERA reached the following conclusions regarding OU1 and OU2:

- Lead and zinc from historic wood treating is of potential concern for small mammals.
- Surface water, sediment, and seeps/springs contribute little to no risk.
- PAHs in soil do not contribute risk
- Bioassay analysis of surface water and sediment (associated with seeps) indicate Hazard Quotient values >20.

IV. Response Actions

A series of response actions were conducted beginning in 1993 to address contamination at the Site. In many cases, contamination within more than one OU was addressed under an individual removal action, including OU3.

All response actions in OU1 were performed as removal actions under action memoranda. The final and comprehensive response action for OU2 was documented under a Record of Decision (ROD).

A summary of the various response actions is provided below. Response actions exclusive to OU3 (CoZinCo facility) are not included in the summary:

1. USEPA first focused its attention on the Site in 1986 as a result of delivery by Butala of creosote-impacted soil excavated from the Koppers property to the Chaffee County Landfill. Thereafter, Beazer removed over 5,000 tons of creosote-stained soil stockpiled by Butala and transported the soils to a RCRA Subtitle C landfill in Granville, Idaho.

2. Removal Action No. 3 (1993 Action Memorandum) – Time critical removal action to remove creosote contaminated sludge from five residential driveways; lead contaminated soil from five residential yards; a slag cinder and debris pile from one residential property, and metal contaminated soil next to the smelter. Two homes were decontaminated to remove lead and arsenic dust. All wastes were stockpiled to the west of the smokestack. Additional work under this removal action included decontaminating rails stored near a residence, removing

surface lead and creosote contamination on the upper terrace area and removing lead and creosote contaminated materials from the banks of the Arkansas River. The elements of this removal action were completed in November 1, 1995.

3. Removal Action No. 6 (1996 Action Memorandum) – Non-time critical removal action to consolidate Site wastes in a five acre area, under a 24-inch soil cover system. The following wastes were consolidated and covered:
    a. Demolition debris from structures in the consolidation area.
    b. Soils with elevated metals and/or creosote stockpiled during Removal Action No. 3.
    c. Soils with elevated metals at various locations within and outside of OU1.

   The elements of this removal action were completed in April 6, 2004.

4. Remedial Action (October 1998 OU2 ROD) – The selected remedy required that the land use for OU2 be restricted to non-residential, prohibits water wells in the Upper Terrace Aquifer (excluding monitoring wells), prohibits mining within the source areas, and requires monitoring of metals and wood-treating constituents in groundwater to verify that they do not migrate beyond their location at the time of remedy implementation. Specific remedy elements included:
    a. Establish baseline groundwater quality conditions including the installation of additional monitoring wells and one year of groundwater and spring monitoring.
    b. Construct a fence around Spring No. 5
    c. Implement institutional controls to prevent residential development, establish a Mining Restricted Area (MRA), and prevent the use of contaminated groundwater (Upper Terrace Aquifer) and groundwater from areas that may impact the movement of contaminated groundwater. The MRA was delineated through the establishment of surveyed monuments.

V. Progress since the Last Review

This is the first five-year review.

VI. Five-Year Review Process

Administrative Components:

This is the first five-year review for the Site. The five-year review was led by Rebecca Thomas, EPA Remedial Project Manager for the Site. The following Team Members participated in the review:

- Rebecca Thomas, EPA Remedial Project Manager
- Rob Henneke, Community Involvement Coordinator
- Pat Courtney, Community Involvement Coordinator
- Richard Sisk, EPA Attorney
- Martin O'Grady, CDPHE Project Manager

EPA Contractors:

- Kenneth Napp, HDR Engineering, Inc.

This five-year review consisted of the following activities: a review of relevant documents; a meeting with representatives of Beazer and Phelps Dodge Corporation (PDC) or their contractors and; risk assessment review; data review; and a site visit. The schedule for the review extended through September 2005.

Community Involvement:

A notice that the five-year review was in progress was placed in the Mountain Mail (Salida Community Newspaper) on July 7, 2005. The notice invited members of the public to submit their questions or comments regarding the review to EPA.

In October 2005, a notice will be placed in a local newspaper announcing that the five-year review has been completed and that copies of the report are available for the public to review at the:

U.S. EPA Region 8 Records Center
999 18th Street (3rd Floor South Tower)
Denver, CO 80202
(303) 312-6473

Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530
(303) 692-2000

EPA interviewed Smeltertown area stakeholders on July 12, 2005. Included in the interviews were a local government official and resident near the site, a property and business owner, the secretary of the Salida Museum Association and potentially responsible parties involved in the Site's cleanup.

All of the persons interviewed expressed satisfaction with the remedial actions to date. The work is well done and the cleanup is a benefit to the area's communities.

Those interviewed believe that the cleanup work is satisfactory with some concerns about the remedy. At OU1, one person interviewed was concerned about the safety of a building and the 365-foot high smokestack on the Site. They did not think the building was in good shape and thought it might be a hazard. There was also some concern about the smokestack. The smokestack has been hit by lightning and some of the bricks have fallen out. The smokestack is owned by the Salida Museum Association. The association has some concern that the smokestack could be a hazard. It will take an engineering assessment to determine its structural integrity. The association has several

ideas for future uses for the smokestack but does not presently have the funds for development.

Another area that needs to be addressed at OU 1 is the five-acre waste pile consolidation area. It was pointed out that institutional controls still need to be placed on the waste pile area for future use.

No concerns were expressed about OU 2.

Those interviewed said that people in the area are generally satisfied with the work. Smeltertown area stakeholders and residents believe that the remedy is protective of human health and the environment.

Document Review:

In preparing this Five-Year Review Report, the following documents were reviewed:

- Record of Decision for OU2, June 14, 1998
- Final Removal Design Report, Smeltertown Superfund Site, Operable Unit 1, April 11, 2003.
- Remedial Action Report, Operable Unit No. 2, Smeltertown Superfund Site, May 2002
- Remedial Action Report, Smeltertown Superfund Site, Operable Unit No. 2, undated report prepared by USEPA, SDMS document ID 2002256
- Emergency Response Involvement at the Smeltertown Site, undated report prepared by USEPA, document No. 433218
- 1993 and 1996 Action Memoranda for time critical and non-time critical removal actions.
- Baseline Risk Assessment

Interviews were conducted with the following individuals to provide supplemental technical information:

- Len Joeris – ENSR (Consultant to Beazer)

Data Review:

The remedy includes a ground water monitoring program designed to track ground water levels and quality both in OU1 and OU2. In preparing this Five-Year Review Report, data from the following reports were reviewed and evaluated:

- 2004 and 2005 Annual Monitoring Report, Operable Unit 2, Smeltertown Superfund Site, May 14, 2004 and June 3, 2005
- Monitoring Well Sampling Event Reports (3), Smeltertown Superfund Site, Operable Unit 1, December 18, 2003; September 10, 2004, December 7, 2004, March 7, 2005.

A summary of these data and their interpretation for demonstrating remedy performance is provided below.

OU1
Performance standards are chemical-specific concentrations in groundwater consisting of a combination of ARARs and risk-based concentrations assuming a 1E-6 residential land use scenario. These standards, which are presented in Section VII, apply to groundwater monitoring wells down-gradient of a waste consolidation area.

Monitoring data indicate that cadmium was detected above the performance standard during the September 2003 and June 2004 event and many of the PAH's were detected above performance standards during the September 2004 event. Neither cadmium or PAH's were detected in the background well (KRMW-1) prior too or during these monitoring events. In response to the elevated PAH concentrations in KRMW-1, groundwater in this well was sampled in December 2004. All contaminants of concern were found to be below performance standards at that time.

Deviations from performance standards are discussed further in Section VII.

OU2:
Potentiometric surface map for November 2003 shows a ground water flow direction to the south-southwest. This is consistent with contour maps generated using data collected in 2000 and presented in the Remedial Action Report.

Performance standards for OU2 are similar (but not identical) to those for OU1 and are chemical-specific concentrations in groundwater consisting of a combination of ARARs and risk-based concentrations assuming a 1E-6 residential land use scenario. These standards, which are presented in Section VII, apply to groundwater monitoring wells and springs in and down-gradient of an area of soils and groundwater contaminated PAH's.

Exceedences of performance standards were not observed at the points of compliance. However, inconsistencies were noted between the ROD, work plans and the actual monitoring program with respect to analytical parameters and detection limits. This limited the ability to assess compliance with performance standards and is discussed further in Section VII.

Overall, contaminant concentrations reportedly have remained stable during 2003 and 2004 at levels somewhat lower than those measured during the baseline monitoring period (2000-2001). Although reporting on the occurrence of DNAPL is a component of the monitoring plan, no data was provided in the Annual Monitoring Report.

Based on the available data, a definitive conclusion regarding compliance with performance criteria is not possible. This is discussed further in Section VII.

Site Inspection:

The Site Inspection was performed on July 12, 2005 by the EPA Remedial Project Manager, Rebecca Thomas; Rob Henneke and Ms. Pat Courtney, Community Involvement Coordinators; and Kenneth Napp, the HDR Project Manager. Personnel from PDC, Beazer and their consultants conducted a tour of the Site. The purpose of the Site inspection was to observe the current Site condition, remedy elements and ground water monitoring network.

All physical remediation elements have been constructed. In OU1, the consolidation area is constructed although vegetation on the cover is sparse. All required monitoring wells have been installed. The perimeter fence generally is in good condition except for a damaged area just south of the smokestack at a corner post (See Photo No. 1 – Attachment 2).

In OU2, all of the surveyed monuments required to delineate the corners of the MRA were noted. However, one additional monument was observed in the northeast corner of the MRA. It was unclear which of the two duplicate monuments actually demarcates the limit of the MRA. It is assumed that until this issue is reconciled, that the monument demarcating the largest dimension of the MRA will be the default monument. A typical monument consists of a steel fence post embedded in a small circular concrete pad surrounded by a protective three foot high joint of reinforced concrete pipe (RCP). This typical installation is shown in Photo No. 5 (Attachment 2. Two of the corner monuments did not have this protective RCP (Photo 6 – Attachment 2).

All monitoring wells required under the OU2 ROD were observed. All but two appeared to be in good condition. Monitoring well No. 5 has obvious damage to the outer protective casing as seen in photo No. 7 (Appendix 2). The lock was missing from the outer protective casing on monitoring well No. 10. An ENSR representative indicated that the well would be secured before the end of the day.

The fence around Spring No. 5 had been constructed and appeared to be in good condition. No flow or creosote odor was observed during the field inspection.

VII. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

<u>The remedy for OU1 consists of the following elements:</u>

1. Interrupt the exposure pathway to contaminated soils through consolidation of contaminated materials under a 24-inch soil cover system.
2. Minimize the likelihood of future disturbance of capped waste through construction of a perimeter fence and implementation of an institutional control to restrict access and future land use.

3. Groundwater monitoring capable of detecting the following chemicals at the associated protective levels based on a 1E-6 residential cancer risk level or ARAR, whichever is greater:

Table 6
OU1 Groundwater Monitoring Performance Standards

Chemical	Protective Level	Basis
Arsenic	50 ug/L[1]	MCL
Manganese	840 mg/L[2]	Risk-based
Antimony	6 ug/L	MCL
Pentachlorophenol	1 ug/L	MCL
Benzo(a)pyrene	0.2 ug/L	MCL
Benzo(b)flouranthene	0.092 ug/L	Risk-based
Benzo(k)flouranthene	0.92 ug/L	Risk-based
Chrysene	9.2 ug/L	Risk-based
Dibenz(a,h)anthracene	0.0092 ug/L	Risk-based
Indeno(1,2,3-cd)pyrene	0.092 ug/L	Risk-based
Benzo(a)anthracene	0.092 ug/L	Risk-based
Lead	15 ug/L	SDWA[3]
Cadmium	5 ug/L	BWQS[4]
Chromium	100 ug/L	BWQS[4]
Copper	1 mg/L	BWQS[4]
Zinc	2 mg/L	AS[5]

[1] – microgram per liter
[2] – milligram per liter
[3] – Safe Drinking Water Act
[4] – Colorado Water Quality Commission Basic Water Quality Standards
[5] – Colorado Water Quality Commission Agricultural Standard

The remedy would be considered to be protective if groundwater monitoring data meets the protective levels described in the above table.

The performance of each remedy element is discussed below:

1. The cover system associated with the consolidation area remains in good condition and therefore, prevents human exposure to consolidated wastes. Vegetative cover is sparse and is dominated by Russian Thistle. However, no erosional features, animal burrows or differential settling were noted during the Site Inspection.
2. The perimeter fence is generally in good condition. A section of fence near a corner post just south of the smokestack is in need of repair (Photo No. 1 – Appendix 2). Institutional controls on OU1 in the form of covenants, conditions and restrictions (CCRs) were filed with Chafee County on November 21, 2001. However, the Declaration of CCRs was not fully executed.
3. Groundwater monitoring has been conducted at the required frequency, for the required chemicals and at the required detection limits, with one exception. The

method detection limit (MDL) for dibenzo(a,h)anthracene is higher than the groundwater performance standard for that chemical (0.0307ug/L MDL vs. 0.0092 ug/L performance standard). The results of the monitoring indicate that cadmium was detected above the performance standard during the September 2003 and June 2004 event and many of the PAH's were detected above performance standards during the September 2004 event. Neither cadmium or PAH's were detected in the background well (KRMW-1) prior too or during these monitoring events. In response to the elevated PAH concentrations in KRMW-1, groundwater in this well was sampled in December 2004. All contaminants of concern were found to be below performance standards at that time.

4. The performance standards for arsenic is based on the current MCL of 50 ug/L. This MCL will be lowered to10 ug/L, effective January 23, 2006. Given this change will occur before the next five-year review, provision should be made to change the groundwater performance standard during this five-year review process.

The remedy for OU2 consists of the following elements:

1. Institutional controls to include a restriction that runs with the land to restrict development and to restrict mining of approximately 6.6 acres of impacted soils.
2. A 6-foot fence constructed around Spring No. 5 to include a locked access gate.
3. Groundwater monitoring capable of detecting the chemicals listed in the following table at the associated protective levels based on a 1E-6 residential cancer risk level. The protective level for lead is based on ARAR.

Table 7
OU2 Groundwater Monitoring Performance Standards

Chemical	Protective Level	Basis
Arsenic	0.06 ug/L[1]	Risk-based
Manganese	840 mg/L[2]	Risk-based
Antimony	15 ug/L	Risk-based
Pentachlorophenol	0.56 ug/L	Risk-based
Benzo(a)pyrene	0.0092 ug/L	Risk-based
Benzo(b)flouranthene	0.092 ug/L	Risk-based
Benzo(k)flouranthene	0.92 ug/L	Risk-based
Chrysene	9.2 ug/L	Risk-based
Dibenz(a,h)anthracene	0.0092 ug/L	Risk-based
Indeno(1,2,3-cd)pyrene	0.092 ug/L	Risk-based
Benzo(a)anthracene	0.092 ug/L	Risk-based
Lead	15 ug/L	SDWA[3]

[1] – microgram per liter
[2] – milligram per liter
[3] – Safe Drinking Water Act

The performance of each remedy element is discussed below:

1. Covenants, Conditions and Restrictions (CCRs) restricting future development and mining in the MRA are in place and on record with Chaffee County. Corner monuments delineating the dimension of the MRA are in place. However, one additional monument was observed in the northeast corner of the MRA. It was unclear which of the two duplicate monuments actually demarcates the limit of the MRA.
2. The 6-foot fence around Spring No. 5 is in place and in good condition.
3. Several inconsistencies were identified between ROD requirements; elements of the monitoring plan described in the Remedial Design (RD) Work Plan and Remedial Action Report (RAR); and the actual monitoring performed. These inconsistencies are addressed under the following general categories:

    Chemicals to be analyzed for:
    Chemicals of concern (COCs) listed in the ROD include PAHs as well as four metals. The list of COCs in the RD Work Plan and RAR is limited to the PAHs. Actual monitoring data is also limited to the PAHs. In addition, naphthalene is included as a COC in the RD Work Plan but is not listed as a COC in the ROD.

    Performance standards:
    The performance standards for pentachlorophenol and benzo(a)pyrene shown in the ROD are inconsistent with the performance standards in the RD Work Plan. Also, the metals are not mentioned as discussed above.

    Detection limits:
    The requirements for analytical method detection limits (MDLs) are driven by the groundwater performance standards. Based on the ROD required performance standards, many of the DLs are too high to resolve whether performance standards are being met at the points of compliance (POCs). For example, the DL for benzo(a)pyrene is 0.190 ug/L while the performance standard in the ROD is 0.0092 ug/L.

    The same is true when comparing the groundwater performance standards published in the RD Work Plan with the MDLs achieved during the monitoring events. However, a few more chemicals have acceptable MDLs under the performance standards published in the RD Work Plan.

    Lastly, most of the MDL's proposed in the Annual Monitoring Section (6.0) of the RAR (ENSR, 2002) were not achieved during the actual monitoring. For example, the RAR proposes MDL's of <1.0 ug/L for PAHs while the actual MDLs achieved during monitoring were as high as 9.4 ug/L. Neither the actual MDLs nor the MDLs proposed in the RAR would have achieved those required by the ROD or the RD Work Plan, as discussed above.

The remedy for OU2 would be considered protective if no further migration of DNAPL or dissolved PAHs is observed. In order to comply with these objectives the following specific measurements and results are required:

- Groundwater performance standards cannot be exceeded at the POC well KRMW-11 or discharge from Spring No. 7 based on annual monitoring.

- DNAPL cannot be observed in wells other than KRMW-7S based on annual monitoring.

In addition to these specific measurements and results, annual groundwater quality monitoring of remaining wells in OU2 at detection limits not exceeding groundwater performance standards is required along with volumetric monitoring of creosote and water from Springs No. 5, 3 and 6. Baseline monitoring consisting of quarterly monitoring of all wells and seeps was also required prior to initiation of annual performance monitoring.

The ability to assess compliance with numerical performance standards for groundwater is limited by the use of high MDLs and the lack of any metals analyses as discussed in the preceding section. In addition, DNAPL thickness measurements were not provided in the annual monitoring reports.

Given these limitations, PAHs were not detected in samples from KRMW-11 or Spring No. 7 during the 2003 and 2004 annual monitoring events.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy selection still valid?

Several toxicity values and intake assumptions have been revised by EPA since the BRA was prepared. The new values and those used in the BRA are summarized on tables presented as Appendix 3.

Remedial goals for groundwater and soils were recalculated based on currently accepted intake assumptions and toxicity values. Remedial goals were calculated only for those chemicals without a regulated level set by ARAR. For groundwater the remedial goals are based on a residential land use scenario at a cancer risk level of 1E-6 and non-cancer hazard quotient of 1E-4. For soils the remedial goals are based on an industrial worker (non-contact intensive worker) land use scenario at a cancer risk level of 1E-4 and a non-cancer hazard quotient of 1E-4. The recalculated remedial goals for groundwater and soil are compared with the original remedial goals on Tables 8 and 9, respectively.

Table 8
Comparison of Original and Recalculated Remedial Goals for Groundwater
Residential Scenario

Chemical	Original Remedial Goal ug/L	Recalculated Remedial Goal ug/L
Manganese	840,000	1,345
Pentachlorophenol	0.56	0.56
Benzo(b)flouranthene	0.092	0.092
Benzo(k)flouranthene	0.92	0.92
Chrysene	9.2	9.2
Dibenz(a,h)anthracene	0.0092	0.0092
Indeno(1,2,3-cd)pyrene	0.092	0.092
Benzo(a)anthracene	0.092	0.092

Table 9
Comparison of Original and Recalculated Remedial Goals for Soil
Industrial Scenario

Chemical	Original Remedial Goal mg/Kg	Recalculated Remedial Goal mg/Kg
Arsenic	387	193
Lead	2,235	626
Pentachlorophenol	4,768	2,650
Benzo(a)pyrene	78	44
Benzo(b)flouranthene	780	435
Dibenz(a,h)anthracene	78	43
Indeno(1,2,3-cd)pyrene	780	434
Benzo(a)anthracene	780	434
HpCDD	0.2	0.2
HxCDD	0.02	0.02
HxCDF	0.02	0.02
OCDD	2	21

In addition to revised toxicity values and intake assumptions, an inconsistency exists in the application of ARARs for groundwater at OU1 and OU2. The 1996 Action Memorandum for OU1 sets groundwater performance standards as the ARAR or risk-based concentrations based on 1E-6 cancer risk under a residential land use scenario, whichever is greater. The OU2 ROD sets groundwater performance standards for the same chemicals using only risk-based concentrations based on 1E-6 cancer risk under a residential land use scenario. This inconsistency results in different groundwater performance standards for antimony, arsenic, benzo(a)pyrene and pentachlorophenol between the two OUs.

A second potential inconsistency exists in the setting of an acceptable cancer risk level used to calculate soil and groundwater performance standards at OU1 And OU2. At both

OU's a 1E-4 cancer risk level (industrial scenario) was the basis for setting soil remediation levels. However, a 1E-6 cancer risk level (residential scenario) was used to set groundwater performance standards (where ARAR were not used).

Question C: Has other information come to light that could call into question the protectiveness of the remedy?

There is no other information that calls into question the protectiveness of the remedy.

Technical Assessment Summary

According to the data reviewed and the Site inspection, the remedy is largely operating as intended by the ROD. The major physical and most administrative remedy elements are in place and functioning. The occurrence of site contaminants above performance standards in OU1 monitoring wells is of potential concern, however, additional monitoring data showing a consistent trend is required prior to consideration of any modification to the remedy. Inconsistencies between monitoring activities required by the decision and planning documents and the actual monitoring program implemented during the review period for both OU's requires resolution.

Protectiveness currently is achieved through interruption of exposure pathways. Engineering controls (fencing) to restrict access to the consolidation area on OU1 are in place. Draft institutional controls to restrict future land use appear to be in place.

The potential for exposure to contaminated subsurface soils on OU2 is minimized through an institutional control prohibiting mining in the areas of subsurface contamination coupled with surface monuments delineating the limits of the MRA. The potential for exposure to contaminated groundwater on OU2 is minimized through an institutional control prohibiting groundwater use.

VIII. Issues

Based on the information collected during the first five-year review, the following issues were identified:

Table 10
Issues

Item No.	Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1	Institutional Controls on land use in OU1 appear to be in draft form.	N	Y
2	Perimeter fence surrounding OU1 consolidation requires minor repair.	N	Y
3	Cadmium regularly detected above groundwater performance standard at OU1.	N	N
4	Detection limit for dibenzo(a,h) anthracene is higher than groundwater monitoring performance standard for OU1.	N	N
5	MCL for arsenic in OU1 to be revised downwards from 50 ug/L to 10 ug/L effective January 23, 2006.	N	TBD[1]
6	An apparent “extra” monument was noted in the northeast portion of the MRE in OU2.	N	N
7	Detection limits and analytical suite for groundwater monitoring at OU2 are inconsistent with requirements of the ROD and Remedial Work Plans.	N	TBD
8	Application of ARARs in lieu of risk-based remedial goals for groundwater are inconsistent between OU1 and OU2.	N	TBD
9	Many intake assumptions and toxicity values have been revised by USEPA since completion of the BRA.	TBD	TBD
10	The use of 1E-6 residential scenario for establishing groundwater performance standards is inconsistent with the use of 1E-4 as the acceptable risk level for industrial soils.	TBD	TBD

1 - To Be Determined

IX. Recommendations and Follow-up Actions

Table 11
Recommendations and Follow-up Actions

Item No	Issues	Recommendations and Follow-up Actions	Party Responsible	Due Date
1	Institutional Controls on land use in OU1 appear to be in draft form.	Evaluate effectiveness.	EPA	December 2006
2	Perimeter fence surrounding OU1 consolidation requires minor repair.	Repair perimeter fence	PRP	December 2005
3	Cadmium regularly detected above groundwater performance standard at OU1.	Continue monitoring of ground water quality trends.	PRP/EPA	On Going
4	Detection limit for dibenzo(a,h) anthracene is higher than groundwater monitoring performance standard for OU1.	Modify analytical method to achieve required detection limit.	PRP	October 2005
5	MCL for arsenic in OU1 to be revised downwards from 50 ug/L to 10 ug/L effective January 23, 2006.	Revise groundwater performance standards.	EPA/CDPHE	December 2006
6	An apparent “extra” monument was noted in the northeast portion of the MRE.	Eliminate the extra monument.	PRP	October 2005
7	Detection limits and analytical suite for groundwater monitoring at OU2 are inconsistent with requirements of the ROD and Remedial Work Plans.	Modify analytical method to achieve required detection limits and add missing chemicals to analytical suite.	PRP	December 2006
8	Application of ARARs in lieu of risk-based remedial goals for groundwater are inconsistent between OU1 and OU2	Remedial goals will be evaluated for groundwater for OU1 and OU2.	EPA/CDPHE	December 2006
9	Many intake assumptions and toxicity values have been revised by USEPA since completion of the BRA	Assess existing soil chemical data to determine whether remaining contamination poses a health risk above a level of concern.	EPA/CDPHE	December 2006
10	The use of 1E-6 residential scenario for establishing groundwater performance standards is inconsistent with the use of 1E-4 as the acceptable risk level for industrial soils.	Evaluate remedial goals for OU1 and OU2.	EPA/CDPHE	December 2006

X. Protectiveness Statement(s)

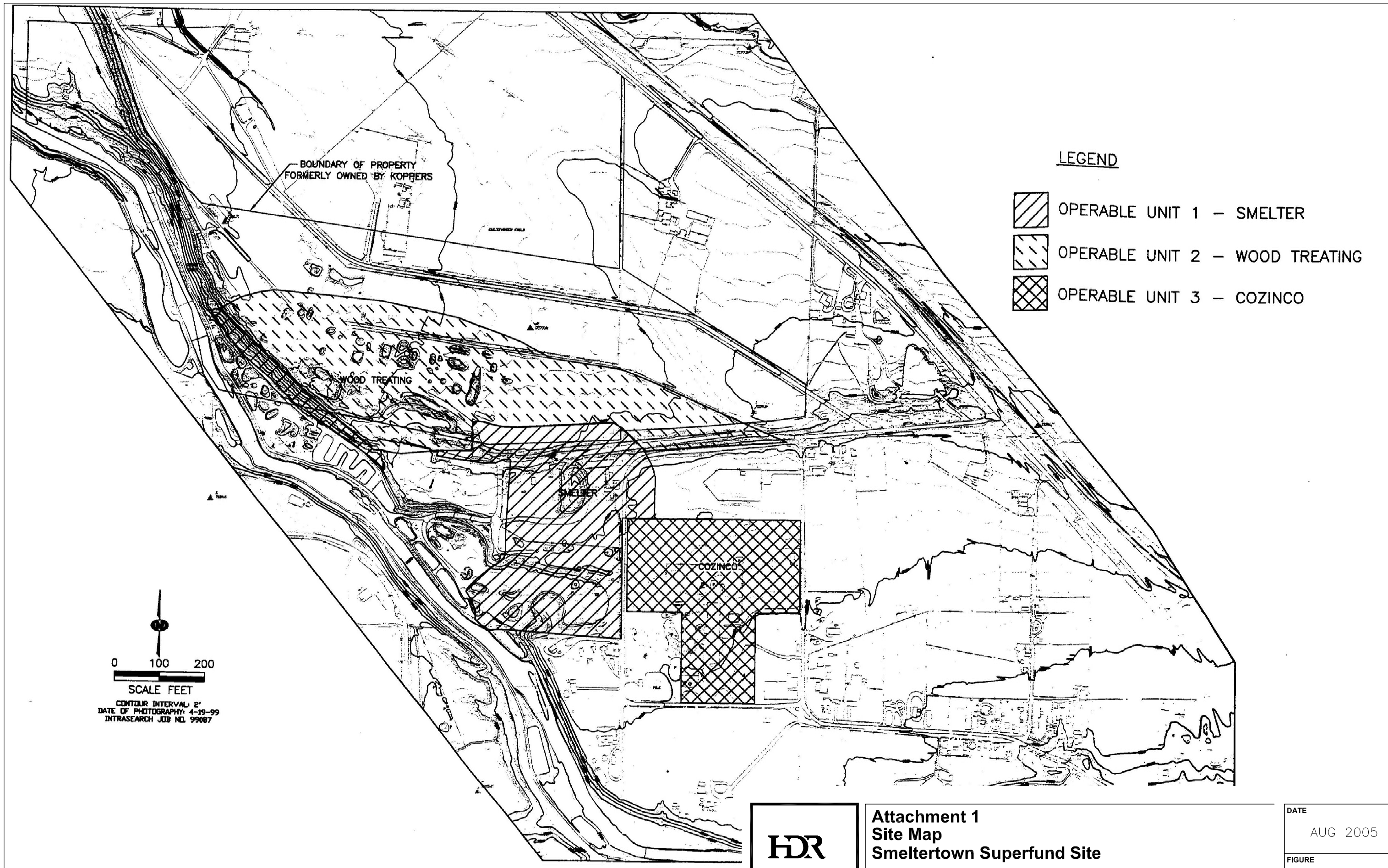
The remedy as implemented is currently protective of human health and the environment. Contaminated ground water associated with OU1 and OU2 is not currently used. Soils and smelter wastes containing contaminants above performance standards are isolated from humans through engineering and administrative controls.

XI. Next Review

The Site requires ongoing five-year reviews in accordance with CERCLA § 121 (c). The next five year review for the Smeltertown Site will be performed by September 2010, five years from the date of this review.

Attachment A

Site Map



HDR

Attachment 1
Site Map
Smeltertown Superfund Site

REPRODUCED FROM ENSR, 2002

DATE
AUG 2005

FIGURE
1

P:\00028754\draft report\SITE MAP.dwg, 8/22/2005 2:54:57 PM, RNelson

Attachment B

Photos

Photo No. 1 - OU1 damaged perimeter fence along east side of repository

Photo No. 2 - Looking north along east margin of OU1 repository

Photo No. 3 - Area of sparse vegetation on OU1 repository

Photo No. 4 - Looking north along west margin of OU1 repository

Photo No. 5 - OU2 mining restriction area monument (typical) in foreground and background

Photo No. 6 - OU2 Mining restriction area monument (atypical)

Photo No. 7 - OU2 monitoring well 5 with damaged protective casing

Attachment C

Risk Calculations

BOWERS MODEL

Basic Equations

PbB = PbB0 + BKSF(ID*AF)
ID = C * IR * EF/365
PbB(95th) = GM*GSD^1.645
Target 95th(fetal) = 10 / Ratio

where

PbB = Geomean PbB in exposed population
PbB0 = Baseline GM PbB in exposed population
BKSF = Biokinetic slope factor (ug/dL increase in PbB per ug/day absorbed)
ID = Ingested dose of lead (ug/day)
AF = Absorption Fraction
C = Concentration of lead
IR = Intake rate
EF = Exposure frequency
Ratio = Fetal to maternal PbB ratio

INPUTS

C(soil)	626	ug/g
PbB0	1.4	ug/dL
BKSF	0.4	ug/dL per ug/day
IR (soil + dust)	100	mg/day
Fraction soil	1	
IR(soil)	100	
IR(dust)	0	
EF	225	days/yr
AF (food)	0.2	
RBA	0.6	
AF (soil and dust)	0.12	
ratio	0.9	
GSD	2.11	

Results

ID (soil)	38.6	ug/day
ID (dust)		
ID (total)		
PbB (GM, adult)	3.3	ug/dL
PbB(95th, fetal)	10.00	ug/dL

RBC	626	ppm

Check 10.00

Changes to IEUBK Parameters (Table 3-5)

Age Group (yrs)	Original		New		Ratio New:Old	
	Dietary Lead Uptake (ug/d)	Soil/Dust Ingestion Rate (mg/d)	Dietary Lead Uptake (ug/d)	Soil/Dust Ingestion Rate (mg/d)	**Dietary Lead Uptake (ug/d)**	**Soil/Dust Ingestion Rate (mg/d)**
0.5-1	5.88	100	3.16	85	0.54	0.85
1-2	5.92	100	2.6	135	0.44	1.35
2-3	6.79	100	2.87	135	0.42	1.35
3-4	6.57	100	2.74	135	0.42	1.35
4-5	6.36	100	2.61	100	0.41	1.00
5-6	6.75	100	2.74	90	0.41	0.90
6-7	7.48	100	2.99	85	0.40	0.85

Note: Text states that default IEUBK parameters were used. Specific GSD not reported previously.

** Adult exposures to lead do not appear to have been evaluated quantitatively in the RA.

Changes to Exposure Parameters for Current Scenarios (Table 3-6)

Exposure Group	Exposure Parameter	Exposure Scenario	Original	Source	New	Source	Ratio New:Old
Resident, Child	Inhalation of Particulates	RME & CTE	20 m^3/d	EPA 1989b	12 m^3/d	EPA Reg3	0.6
Tresspasser, Child	Body Weight	RME & CTE	38 kg	EPA 1989b	43 kg	EPA 1997	1.1

EPA 1989b = 1989 Exposure Factors Handbook
EPA Reg 3 = EPA Region 3 Screening Values
EPA 1997 = 1997 Exposure Factors Handbook

Note: All other exposure parameters not presented in this table remain unchanged.

EPA 1997, Table 7.3

	boys, mean (kg)	girls, mean (kg)
age 7	25.1	24.7
age 8	28.2	27.9
age 9	31.1	31.9
age 10	36.4	36.1
age 11	40.3	41.8
age 12	44.2	46.4
age 13	49.9	50.9
age 14	57.1	54.8
age 15	61	55.1
age 16	67.1	58.1
avg	43.4	

Changes to Exposure Parameters for Future Scenarios (Table 3-7)

Exposure Group	Exposure Parameter	Exposure Scenario	Original	Source	New	Source	Ratio New:Old
Construction Worker	Ingestion of Soil	RME	480 mg/d	EPA 1993a	330 mg/d	SSG, EPA 1996	0.69
		CTE	100 mg/d		165 mg/d		1.65
Construction Worker	Inhalation of Particulates	RME	24 m^3/d	EPA 1989b	16 m^3/d	EPA 1997	0.67
		CTE	11.2 m^3/d		8.3 m^3/d		0.74
Resident, Child	Inhalation of Particulates	RME & CTE	20 m^3/d	EPA 1989b	12 m^3/d	EPA Reg3	0.60

EPA 1997, Table 5.23
activity type, mean

	(m^3/hr)	(m^3/8-hr d)
heavy	2.5	20
moderate	1.5	12
adult resting	1.1	8.8
RME		16.0
CTE		8.3

EPA 1989b = 1989 Exposure Factors Handbook
EPA Reg 3 = EPA Region 3 Screening Values
EPA 1997 = 1997 Exposure Factors Handbook
SSG = Soil Screening Guidance

Note: All other exposure parameters not presented in this table remain unchanged.

Changes to Exposure Parameters for Dermal Absorption from Soil (Table 3-8)

Exposure Group	Exposure Parameter	Exposure Scenario	Original	Source	New	Source	Ratio New:Old
Workers & Residents, adult	Surface Area (hands, head, forearms)	RME & CTE	3,100 cm^2	EPA 1989b	RME=5,800 cm^2 CTE=5,000 cm^2	EPA 1997	RME = 1.87 CTE = 1.61
					3,600 cm^2	EPA 1997	1.16
					5,700 cm^2	SSG, EPA 1996	1.84
Resident, child (age 1-6yrs)	Surface Area (hands, head, neck, arms, legs)	RME & CTE	2,000 cm^2	EPA 1989b	4,200 cm^2	EPA 1997	2.10
					2,800 cm^2	SSG, EPA 1996	1.40
Trespasser, child (age 7-16yrs)	Surface Area (hands, head, neck, arms, legs)	RME & CTE	3,700 cm^2	EPA 1989b	7,156 cm^2	EPA 1997	1.93
					RME=5,800 cm^2 CTE=5,000 cm^2	EPA 1997	RME = 1.57 CTE = 1.35
					5,700 cm^2	SSG, EPA 1996	1.54
Workers & Residents, adult	Adherence Factor	RME	1 mg/cm^2	EPA 1992b	n/a	SSG, EPA 1996	
		CTE	0.2 mg/cm^2	EPA 1992b	0.2 mg/cm^2	EPA 1992b	1.00
					0.07 mg/cm^2	SSG, EPA 1996	0.35
Residents, child	Adherence Factor	RME	1 mg/cm^2	EPA 1992b	n/a	SSG, EPA 1996	
					1 mg/cm^2	EPA 1992b	1.00

EPA 1989b = 1989 Exposure Factors Handbook

EPA 1997 = 1997 Exposure Factors Handbook
EPA 1992b = Dermal Exposure Guidance
SSG = Soil Screening Guidance

Note: All other exposure parameters not presented in this table remain unchanged.

EPA 1997, Table 6.2

adult male surface area, median

	m^2	cm^2
head	0.13	1300
forearms	0.131	1310
hands	0.099	990
		3600

EPA 1997, Table 6.8
% total surface area, avg of means for age <1 to <7

head	14.9			
hands	5.5			
arms	13.3			
legs	24.8			
neck	--			
	58.5	% * SA =	4022	cm^2

Total Surface Area
avg 6880
**See calculation on Dermal_Water tab

EPA 1997, Table 6.8
% total surface area, avg of means for age 7 to <16

head	7.7			
hands	5.3			
arms	12.7			
legs	30.4			
neck	--			
	56.0	% * SA =	7156	cm^2

Table 6.6 (male, median)

	m^2	cm^2
age 7<8	0.936	9360
age 8<9	1	10000
age 9<10	1.07	10700
age 10<11	1.18	11800
age 11<12	1.23	12300
age 12<13	1.34	13400
age 13<14	1.47	14700
age 14<15	1.61	16100
age 15<16	1.7	17000

Table 6.7 (female, median)

	m^2	cm^2
age 7<8	0.917	9170
age 8<9	1	10000
age 9<10	1.06	10600
age 10<11	1.17	11700
age 11<12	1.3	13000
age 12<13	1.4	14000
age 13<14	1.48	14800
age 14<15	1.55	15500
age 15<16	1.57	15700
	avg	12768

Changes to Exposure Parameters for Dermal Absorption from Water (Table 3-9)

Exposure Group	Exposure Parameter	Exposure Scenario	Original	Source	New	Source	Ratio New:Old
Resident, adult	Surface Area (whole body)	RME & CTE	20,000 cm^2	EPA 1989b	23,000 cm^2	EPA 1997	1.15
Resident, child (age 1-6 yrs)	Surface Area (whole body)	RME & CTE	6,800 cm^2	EPA 1989b	6,880 cm^2	EPA 1997	1.01
Resident, child (age 1-6 yrs)	Surface Area (hands only)	RME & CTE	370 cm^2	EPA 1989b	376 cm^2	EPA 1997	1.02

EPA 1989b = 1989 Exposure Factors Handbook
EPA 1997 = 1997 Exposure Factors Handbook

Note: All other exposure parameters not presented in this table remain unchanged.

Table 6.6 (male, median)

	m^2	cm^2
age <2	n/a	n/a
age 2<3	0.603	6030
age 3<4	0.664	6640
age 4<5	0.731	7310
age 4<6	0.793	7930

Table 6.7 (female, median)

	m^2	cm^2
age <2	n/a	n/a
age 2<3	0.579	5790
age 3<4	0.649	6490
age 4<5	0.706	7060
age 4<6	0.779	7790
	avg	6880

"Industrial" Worker HIF, RME

	non-cancer	cancer	
ingestion of soil	8.81E-01	3.15E-01	mg soil/kg/d
inhalation of PM10	1.76E-01	6.29E-02	m3/kg/d
site-specific PEF	5.00E-02	mg PM10/m3	
dermal contact with soil		*aldrin/PCB only*	

	RME
IRsoil (mg/d)	100
Inh. (m3/d)	20
EF (d/yr)	225
ED (yr)	25
BW	70

Source: USEPA 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. December 2002.

Non-Cancer	C Soil mg/kg soil	Intake	oRfD	HQ	C PM10 mg/m3	Intake	iRfD	HQ	Total HQ
arsenic	341	3.00E-04	3.00E-04	1E+00	-	-	-	-	1.00E+00
benzo(a)anthracene	-	-	-	-	-	-	-	-	
benzo(a)pyrene	-	-	-	-	-	-	-	-	
benzo(b)fluoranthene	-	-	-	-	-	-	-	-	
dibenz(ah)anthracene	-	-	-	-	-	-	-	-	
indeno(123cd)pyrene	-	-	-	-	-	-	-	-	
pentachlorophenol	34067	3.00E-02	3.00E-02	1E+00	-	-	-	-	1.00E+00
HpCDD	-	-	-	-	-	-	-	-	
HxCDD	-	-	-	-	-	-	-	-	
HxCDF	-	-	-	-	-	-	-	-	
OCDD	-	-	-	-	-	-	-	-	
lead (from Bowers Model)	626								

RBC SUMMARY

	OLD mg/kg	NEW mg/kg
arsenic	387	193
benzo(a)anthracene	780	434
benzo(a)pyrene	78	44
benzo(b)fluoranthene	780	435
dibenz(ah)anthracene	78	43
indeno(123cd)pyrene	780	434
pentachlorophenol	4768	2650
HpCDD	0.2	0.2
HxCDD	0.02	0.02
HxCDF	0.02	0.02
OCDD	2	21
lead (from Bowers Model)	2235	626

Cancer	C Soil mg/kg soil	Intake	oSF	Risk	C PM10 mg/m3	Intake	iSF	Risk	Total Risk
arsenic	193	6.06E-05	1.50E+00	9.1E-05	9.64E-06	6.06E-07	1.50E+01	9.1E-06	1.00E-04
benzo(a)anthracene	434	1.36E-04	7.30E-01	1.0E-04	2.17E-05	1.36E-06	3.10E-01	4.2E-07	1.00E-04
benzo(a)pyrene	44	1.37E-05	7.30E+00	1.0E-04	2.18E-06	1.37E-07	3.10E-01	4.2E-08	1.00E-04
benzo(b)fluoranthene	435	1.37E-04	7.30E-01	1.0E-04	2.18E-05	1.37E-06	3.10E-02	4.2E-08	1.00E-04
dibenz(ah)anthracene	43	1.36E-05	7.30E+00	1.0E-04	2.17E-06	1.36E-07	3.10E+00	4.2E-07	1.00E-04
indeno(123cd)pyrene	434	1.36E-04	7.30E-01	1.0E-04	2.17E-05	1.36E-06	3.10E-01	4.2E-07	1.00E-04
pentachlorophenol	2650	8.33E-04	1.20E-01	1.0E-04	1.32E-04	8.33E-06	-	-	1.00E-04
HpCDD	0.21	6.60E-08	1.50E+03	9.9E-05	1.05E-08	6.60E-10	1.50E+03	9.9E-07	1.00E-04
HxCDD	0.021	6.60E-09	1.50E+04	9.9E-05	1.05E-09	6.60E-11	1.50E+04	9.9E-07	1.00E-04
HxCDF	0.021	6.60E-09	1.50E+04	9.9E-05	1.05E-09	6.60E-11	1.50E+04	9.9E-07	1.00E-04
OCDD	21.0	6.60E-06	1.50E+01	9.9E-05	1.05E-06	6.60E-08	1.50E+01	9.9E-07	1.00E-04

"Construction" Worker HIF, RME

	non-cancer	cancer	
ingestion of soil	2.91E+00	1.04E+00	mg soil/kg/d
inhalation of PM10	1.76E-01	6.29E-02	m3/kg/d
site-specific PEF	5.00E-02	mg soil/m3	
dermal contact with soil	*aldrin/PCB only*		

	RME
IRsoil (mg/d)	330
Inh. (m3/d)	20
EF (d/yr)	225
ED (yr)	25
BW	70

uses construction worker ingestion rates for soil, but exposure frequency and duration rates for "industrial" worker

Non-Cancer	C Soil mg/kg soil	Intake	oRfD	HQ	C PM10 mg/m3	Intake	iRfD	HQ	Total HQ
arsenic	103	3.00E-04	3.00E-04	1E+00	-	-	-	-	1.00E+00
benzo(a)anthracene	-	-	-	-	-	-	-	-	
benzo(a)pyrene	-	-	-	-	-	-	-	-	
benzo(b)fluoranthene	-	-	-	-	-	-	-	-	
dibenz(ah)anthracene	-	-	-	-	-	-	-	-	
indeno(123cd)pyrene	-	-	-	-	-	-	-	-	
pentachlorophenol	10323	3.00E-02	3.00E-02	1E+00	-	-	-	-	1.00E+00
HpCDD	-	-	-	-	-	-	-	-	
HxCDD	-	-	-	-	-	-	-	-	
HxCDF	-	-	-	-	-	-	-	-	
OCDD	-	-	-	-	-	-	-	-	
lead (from Bowers Model)	190								

RBC SUMMARY

	OLD mg/kg	NEW mg/kg
arsenic	387	62
benzo(a)anthracene	780	132
benzo(a)pyrene	78	13
benzo(b)fluoranthene	780	132
dibenz(ah)anthracene	78	13
indeno(123cd)pyrene	780	132
pentachlorophenol	4768	803
HpCDD	0.2	0.06
HxCDD	0.02	0.006
HxCDF	0.02	0.006
OCDD	2	6
lead (from Bowers Model)	2235	190

Cancer	C Soil mg/kg soil	Intake	oSF	Risk	C PM10 mg/m3	Intake	iSF	Risk	Total Risk
arsenic	62	6.47E-05	1.50E+00	1E-04	3.12E-06	1.96E-07	1.50E+01	3E-06	1.00E-04
benzo(a)anthracene	132	1.37E-04	7.30E-01	1E-04	6.59E-06	4.15E-07	3.10E-01	1E-07	1.00E-04
benzo(a)pyrene	13	1.37E-05	7.30E+00	1E-04	6.60E-07	4.15E-08	3.10E-01	1E-08	1.00E-04
benzo(b)fluoranthene	132	1.37E-04	7.30E-01	1E-04	6.60E-06	4.15E-07	3.10E-02	1E-08	1.00E-04
dibenz(ah)anthracene	13	1.37E-05	7.30E+00	1E-04	6.59E-07	4.15E-08	3.10E+00	1E-07	1.00E-04
indeno(123cd)pyrene	132	1.37E-04	7.30E-01	1E-04	6.59E-06	4.15E-07	3.10E-01	1E-07	1.00E-04
pentachlorophenol	803	8.33E-04	1.20E-01	1E-04	4.01E-05	2.53E-06	-	-	1.00E-04
HpCDD	0.06	6.65E-08	1.50E+03	1E-04	3.20E-09	2.01E-10	1.50E+03	3E-07	1.00E-04
HxCDD	0.006	6.65E-09	1.50E+04	1E-04	3.20E-10	2.01E-11	1.50E+04	3E-07	1.00E-04
HxCDF	0.006	6.65E-09	1.50E+04	1E-04	3.20E-10	2.01E-11	1.50E+04	3E-07	1.00E-04
OCDD	6.4	6.65E-06	1.50E+01	1E-04	3.20E-07	2.01E-08	1.50E+01	3E-07	1.00E-04

Resident HIF, RME

	non-cancer	cancer	
TWA ingestion of gw	3.47E-02	1.49E-02	L/kg/d

HIF	
IR child	1
IR adult	2
BW child	15
BW adult	70
EF	350
ED child	6
ED adult	24
HIF nc	3.47E-02
HIF c	1.49E-02

Non-Cancer	C GW mg/L		C GW ug/L	Intake	oRfD	HQ	RBC old ug/L
arsenic	-	-				-	not risk-based
lead	-	-				-	not risk-based
cadmium	-	-				-	not risk-based
chromium	-	-				-	not risk-based
copper	-	-				-	not risk-based
zinc	-	-				-	not risk-based
antimony	-	-				-	not risk-based
manganese		1.3447	1345	4.67E-02	4.67E-02	1.00E+00	840000
pentachlorophenol		0.8645	864	3.00E-02	3.00E-02	1.00E+00	0.56
benzo(a)pyrene	-	-		-	-	-	0.0092
benzo(b)fluoranthene	-	-		-	-	-	0.092
benzo(k)fluoranthene	-	-		-	-	-	0.92
chrysene	-	-		-	-	-	9.2
dibenz(ah)anthracene	-	-		-	-	-	0.0092
indeno(123cd)pyrene	-	-		-	-	-	0.092
benzo(a)anthracene	-	-		-	-	-	0.092

Cancer	C GW mg/L		C GW ug/L	Intake	oSF	Risk	RBC old ug/L
arsenic	-	-				-	not risk-based
lead	-	-				-	not risk-based
cadmium	-	-				-	not risk-based
chromium	-	-				-	not risk-based
copper	-	-				-	not risk-based
zinc	-	-				-	not risk-based
antimony	-	-				-	not risk-based
manganese	-	-		#VALUE!	-	-	840000
pentachlorophenol		5.60E-04	0.56	8.33E-06	1.20E-01	1.00E-06	0.56
benzo(a)pyrene		9.21E-06	0.0092	1.37E-07	7.30E+00	1.00E-06	0.0092
benzo(b)fluoranthene		9.21E-05	0.092	1.37E-06	7.30E-01	1.00E-06	0.092
benzo(k)fluoranthene		9.21E-04	0.92	1.37E-05	7.30E-02	1.00E-06	0.92
chrysene		9.21E-03	9.2	1.37E-04	7.30E-03	1.00E-06	9.2
dibenz(ah)anthracene		9.21E-06	0.0092	1.37E-07	7.30E+00	1.00E-06	0.0092
indeno(123cd)pyrene		9.21E-05	0.092	1.37E-06	7.30E-01	1.00E-06	0.092
benzo(a)anthracene		9.21E-05	0.092	1.37E-06	7.30E-01	1.00E-06	0.092

RBC SUMMARY

	OLD ug/L	NEW ug/L
arsenic	not risk-based	-
lead	not risk-based	-
cadmium	not risk-based	-
chromium	not risk-based	-
copper	not risk-based	-
zinc	not risk-based	-
antimony	not risk-based	-
manganese	840000	1345
pentachlorophenol	0.56	0.56
benzo(a)pyrene	0.0092	0.0092
benzo(b)fluoranthene	0.092	0.092
benzo(k)fluoranthene	0.92	0.92
chrysene	9.2	9.2
dibenz(ah)anthracene	0.0092	0.0092
indeno(123cd)pyrene	0.092	0.092
benzo(a)anthracene	0.092	0.092

Changes to Cancer Slope Factors (Table 4-1)

Analyte	Original					New							Ratio New:Old	
	oCSF	Source	iCSF	Source	WOE	oCSF	+/-	Source	iCSF	+/-	Source	WOE	**oCSF**	**iCSF**
PAHs														
Benzo(a)pyrene			6.10E+00	HEAST 1992					**3.10E+00**	**-**	**EPA-NCEA**			0.51
Benzo(a)anthracene			6.10E-01						**3.10E-01**	**-**				0.51
Benzo(b)fluoranthene			6.10E-01						**3.10E-01**	**-**				0.51
Benzo(k)fluoranthene			6.10E-02						**3.10E-02**	**-**				0.51
Dibenz(a,h)anthracene			6.10E+00						**3.10E+00**	**-**				0.51
Indeno(1,2,3-c,d)pyrene			6.10E-01						**3.10E-01**	**-**				0.51
Chrysene			6.10E-03						**3.10E-03**	**-**				0.51
PCBs/Pesticides														
Aldrin			1.70E+01	HEAST 1994					1.70E+01		**IRIS**			source changed
Aroclor (PCBs)	7.70E+00	IRIS	n/a			**2.00E+00**	**-**	**IRIS**	**2.00E+00**	**+**	**IRIS**		0.26	new iCSF
Metals														
Arsenic	1.75E+00	IRIS				**1.50E+00**	**-**	IRIS					0.86	
Beryllium	4.30E+00	IRIS			B2	**n/a**	**-**	IRIS				**B1**	old removed	

+/- = potential impact on calculated risks
+ = risks will increase
- = risks will decrease

Note: All other CSFs not shown in this table remain unchanged.

Changes to Dioxin/Furan TEFs (Table 4-3)

Congener	Human TEFs		+/-	**Ratio New:Old**
	Original (1)	New (2)		
PeCDD	0.5	**1**	+	2
OCDD	0.001	**0.0001**	-	0.1
OCDF	0.001	**0.0001**	-	0.1

Source:
(1) EPA (1989b)
(2) Van den Berg et al. (1998)

+/- = potential impact on calculated risks
+ = risks will increase
- = risks will decrease

Note: All other TEFs not shown in this table remain unchanged.

Changes to Non-Cancer Chronic Reference Doses (Table 4-4)

Analyte	Original oRfD	Original Source	Original iRfD	Original Source	Original UF/MF	Original Conf.	Original Effect	New oRfD	+/-	New Source	New iRfD	+/-	New Source	New UF/MF	New Conf.	New Effect	Ratio New:Old oRfD	Ratio New:Old iRfD
PAHs																		
Naphthalene	withdrawn		n/a					**2.00E-02**	**+**	**IRIS**	**9.00E-04**	**+**	**IRIS**	**3000/1**	**Low**	**Decreased body weight**	new RfD	new RfD
PCBs/Pesticides																		
Aroclor (PCBs)	7.00E-06	HEAST 1994						**7.00E-05**	**-**	**IRIS**				100/1	Medium	Reduced birth weight	10	
								2.00E-05	**-**	**IRIS**				300/1	Medium	Immunological effects	2.86	
Metals																		
Aluminum	n/a							**1.00E+00**	**+**	**EPA Peer-Rev.**	**1.00E-03**	**+**	**EPA Peer-Rev.**				new RfD	new RfD
Beryllium	5.00E-03	IRIS	n/a		100/1	Low	No adverse effect	**2.00E-03**	**+**	**IRIS**	**5.70E-06**	**+**	**IRIS**	**300/1**	**Low-Mod.**	**Intestinal lesions**	0.40	new RfD
Cadmium			n/a								**5.70E-05**	**+**	**EPA-NCEA**					new RfD
Chromium (III)	1.00E+00	IRIS						**1.50E+00**	**-**	**IRIS**							1.50	
Cobalt	n/a		n/a					**2.00E-02**	**+**	**EPA Peer-Rev.**	**5.70E-06**	**+**	**EPA Peer-Rev.**				new RfD	new RfD
Copper	3.70E-02	(a)						**4.00E-02**	**-**	**HEAST 1997**							1.08	
Manganese	5.00E-03	IRIS (water)	1.10E-04	IRIS				**4.67E-02**	**-**	**IRIS (water)**	**1.43E-05**	**+**	**IRIS**				9.33	0.13
	1.40E-01	IRIS (diet)						1.40E-01		IRIS (diet)								
Mercury	3.00E-04	HEAST 1994	8.60E-05	HEAST 1994				**n/a**			8.60E-05		**IRIS**				old removed	

Note: All other RfDs not shown in these tables remain unchanged.
(a) calculated from drinking water standard

+/- = potential impact on calculated risks
+ = risks will increase
- = risks will decrease

Changes to Non-Cancer Subchronic Reference Doses (Table 4-4)

Analyte	Original oRfD	Original Source	New oRfD	New Source	New +/-	Ratio New:Old
PAHs						
Anthracene	6.00E-01	HEAST 1994	**3.00E+00**	**HEAST 1997**	**-**	5.0
Metals						
Manganese (water)	5.00E-03	HEAST 1994	**4.67E-02**	**HEAST 1997**	**-**	9.3

Note: All other RfDs not shown in these tables remain unchanged.